

was growing acuter until he went to sleep, after which the hallucination had vanished. The subject retired after ninety hours waking and immediately fell asleep, but was hourly roused (to test the depth of his sleep) and each time immediately lapsed into profound sleep. After ten and a half hours sleep he awakened spontaneously, felt wholly refreshed and as well as ever. The following night he slept two hours longer than usual. At the conclusion of the sleep fast the subject had gained twenty-seven ounces in weight, but after his ten and a half hours sleep he had lost thirty-eight ounces in weight. Although acuteness of vision gradually increased up to the time of sleeping, it fell below the normal after sleep. Voluntary motor ability decreased (tested by rapid tapping of the forefinger on a key connected with a recording drum and graphic chronometer). The pulse, which was eighty-eight the first evening, gradually lost until it was sixty-one, the fourth evening, but the pulse, which after fatigue the first evening was eighty-nine, dropped to fifty-two after fatigue on the fourth evening. Sensibility to pain in both upper and lower thresholds, gradually decreased slightly, but returned to the normal on the fourth evening a few hours before sleeping. Memory gradually declined but returned to the normal the last evening, and after sleep it dropped more than two-thirds. Attention gradually waned (as tested by the adding of figures) but was approaching the normal on the fourth evening and after sleep it was fully restored. Grip and pulse slightly decreased. Reaction time somewhat increased and returned to the normal after sleep. His temperature was hardly changed.

Case 2. An instructor, aged twenty-seven, single, quiet, of excellent health and accustomed to nine hours sleep.

Case 3. An instructor, aged twenty-four, single, stout, perfectly healthy and accustomed to eight hours sleep.

Both Cases, 2 and 3, started their sleep-fast at the same time and under the same circumstances and continued it for eighty-eight and one-quarter hours. Unlike Case 1 (which was a preliminary experiment), neither of them experienced any hallucination of vision or any serious suffering. Case 2 was very sleepy the last twenty-four hours. Both slept immediately upon retiring and awoke wholly refreshed, Case 2 after eleven and a quarter hours and Case 3 after fifteen and one-sixth hours. Both subjects gained in weight before sleeping and lost after, or rather during sleep, but, unlike Case 1, their decrease in weight was less than their increase. The observations made were about the same in all cases. According to time measurement Case 2 only found it necessary to make up for sixteen per cent. of his lost sleep; Case 1, twenty-five per cent. and Case 3, thirty-five and three-tenths per cent. It is suggested that this may be accounted for in two ways, viz.: partial sleep during the waking hours or by depth of sleep afterwards. The fact that the subjects all had dreams while awake during the experiments, and the fact also that their sleep was very profound, would indicate that both suppositions accounted for the apparent deficiency. Their urine had an increase of nitrogen and phosphoric acid during the period of insomnia, and relatively more phosphoric acid than nitrogen was excreted. CHRISTISON.

PHYSICAL AND MENTAL MEASUREMENTS OF THE STUDENTS OF COLUMBIA UNIVERSITY. By Prof. J. McKen Cattell and Dr. Livingston Farrand.

From the *Psychological Review*, Nov., 1896, pp. 618-648.

The authors state, "their chief object in the present paper is the description and discussion of methods rather than the communication of results," and that their object is to "know how a man, for example, has a large head, a short reaction time or a good memory, is likely to vary from the average in other directions, and how likely he is to vary to a certain extent." In this set of experiments they give the

averages of 100 students, 80 being freshmen, and the series contain 10 records and 20 measurements, which were completed within from 40 minutes to an hour; all the recorders had had training in making the tests. About one-half of the students did not vary more than the amount equal to the average of their groups, and these are considered normal. Those above this variation (i. e., twice the average) are considered hyper-normal, and those going below it as sub-normal.

Here is a splendid start towards the construction of a mental criterion much needed, and while the authors evidently comprehend the great importance of their work, they modestly invite suggestions tending to enhance its value in further investigations. Their undertaking so far has been comparatively limited, but they intend to supplement their labors by additional questions conveying almost every point thought to be of possible value, or which in associated relations may help to bring forth a really normal criterion in place of a common one, and reveal more about our common failings as well as defects in our civilization. From this line of investigations we will learn more of our possibilities in nature. But there are several points of inquiry which should be added to the already large lists proposed, and without which some important data will not be secured.

1. The hereditary affections, such as insanity, epilepsy, paralysis, convulsions, asthma, consumption, scrofula, cancer, etc., should be specially inquired into for several generations back.

2. Anything noteworthy in the history of either parents should be mentioned.

3. Remarkable or affecting personal experiences of the subject (student) should be given.

4. His hours of sleep (which in the 24), its quality and mode of onset.

5. Hours and conditions most favorable for study, and how long at a time can he study without fatigue.

6. Habitual dietary: articles particularly liked, articles particularly offensive to nose, palate or stomach.

7. The question of sexual continence or incontinence should also be put in some effectual way since functional impairment of the senses and mental dullness are not infrequently produced by onanism and excessive venery.

8. The hour of the day and the month in which the observations are made, should also be given.

But these questions can only be successfully presented by a shrewd and experienced physician in private. Indeed, the whole investigation should be conducted by a check system, instead of the students' names, and strict confidence the rule. All the delicate inquiries should be made by an outside physician. As this matter is of much interest to neurologists, Prof. Cattell should have no difficulty in finding the medical assistance required.

Students examined 100. Average age, 18 years, and none over 23 years:—

Hair—Black, 8; dark brown, 56; light brown, 34; flaxen, 1; red, 0; not given, 1.

Eyes—Gray, 33; blue, 30; brown, 31; green, 1; not given, 5.

Height—Average in c. m., 175.1.

Weight—Average in Kg., 66.2.

(Both their height and weight are stated as above the average of the population.)

Head—Length, 19.3; v, 0.5; V, 0.2. Breadth, 14.9; v, 0.4; V, 0.1.

Breathing capacity—(98 cases) in litres: 3.73; v, 0.45; V, 0.19.

NOTE—"v" stands for average variation in sets of 10. "V" stands for average variation between sets of 10 and the average of 100.

Vision—Color: (71 cases) 3 per cent. were color blind, and 3 per cent. had defective color vision. Keeness: (94 cases) The right eye

was found to be better than the left. Preference for color: (66 cases) Blue, 34.9 per cent.; red, 22.7 per cent.; violet, 12.1 per cent.; yellow, 7.5 per cent.; green, 6.1 per cent.; white, 6.1 per cent.; no preference, 10.6 per cent.

Hearing—(86 cases) Right ear: normal, 86; sub-normal, 13; abnormal, 1. Left ear: normal, 84; sub-normal, 13; abnormal, 3. In perception of pitch (48 cases), the average variation was nearly one whole tone. 10 per cent. could adjust the monochord within about the one-tenth of a tone; 61 per cent. came between one-tenth and one tone, and 29 per cent. had a greater error.

Dermal sensation was determined by using the æsthesiometer in which the points were 2 c.m. apart and were applied longitudinally on the back of the left hand, between the tendons of the fingers. Five tests were made (49 cases), viz., 2, 2, 1, 1, 2. Correct: 16 per cent., 5 times; 38 per cent., 4 times; 20 per cent., 3 times; 22 per cent., 2 times; 2 per cent., 1 time; 2 per cent., 0 times.

The answers were correct in 67 per cent. of all the trials; 60 per cent. of the cases with two points, and 7.5 per cent. of the cases with one point.

Movement sensation was tested by pulling with a dynamometer three pairs of pulls of about 4 Kg. in strength (48 cases). The average error was 0.63 Kg.

Sensitiveness to pain was tested by an algometer on the ball of right and left thumb (95 cases). Right average: 6.90 Kg.; *v*, 2.90; *V*, 0.96. Left average: 6.70 Kg.; *v*, 2.64; *V*, 1.94.

Strength of hands was measured by the oval dynamometer; two tests being made with each hand in alternation (99 cases). Right average, 38.9 Kg.; *v*, 5.7; *V*, 2.4. Left: 36.4 Kg.; *v*, 5.3; *V*, 2.6.

Time Measurement.—The reaction time for sound measured five times in succession with the Hipp chronoscope gave the following results (97 cases). Reaction time: average, 174 ($v=29'$); *v*, 30; *V*, 13. Time in . Marking 100 A's, mixed with 40 other capitals, gave (93 cases): average, 93 secs.; *v*, 12.8; *V*, 6.4.

Average number of A's omitted, 2.6; and seldom a wrong letter was marked.

Perception of Space.—A standard line, 10 c.m. in length, was given on a piece of paper to be copied on another piece (93 cases). Average variation: 6.5; *v*, 3.4; *V*, 0.9.

Perception of Time.—A tap began and ended ten seconds, and the student gave a tap when he thought 10 seconds more had passed. Time in seconds: Average, 1.57; *v*, 0.81; *V*, 0.20.

Memory.—Three quarters of an hour after the line test for space the student was required to draw from memory another line of the same length (10 c.m.), without previously knowing he would have to do so (21 cases): average error, 7.3 m.m.

After Images.—The student saw in a dark room for 15 seconds a white light of determined area and intensity. Of the 75 students tested, 73.3 per cent. saw an after image, the duration of which was on an average 44.2 secs.; *v*, 25.2; *V*, 3.9. Duration of period (latent) between the first and second images was on an average of 16.2 secs.; *v*, 9.4; *V*, 6.2. In 61.8 per cent. of the cases the image reappeared in 29.1 per cent. it appeared three or more times; in 7.3 per cent. it appeared four or more times, and in 3.8 per cent. it appeared five times. The after image when first seen was sometimes positive and sometimes negative, and the colors varied greatly, being distributed, in the first place noticed, as follows—negative or dark, 33.3 per cent; light or white, 29.4 per cent.; blue, 13.7 per cent.; purple, 9.8 per cent.; green, 5.9 per cent.; yellow, 3.9 per cent.; red, 2.0 per cent.; miscellaneous, 2.0 per cent.

Imagery was tested by letting the students fill in a blank containing the questions below (95 cases): Think of your breakfast table

as you sat down to it this morning. Call up the appearance of the table, the dishes and food on it, the persons present, etc.; then write answers to the following questions—

1. Are the outlines of the objects distinct and sharp? Yes, 86.5 per cent.; no, 6.2 per cent.; miscellaneous, 7.3 per cent.

2. Are the colors bright and natural? Yes, 83.3 per cent.; no, 10.4 per cent.; miscellaneous, 6.3 per cent.

3. Where does the image seem to be situated? In the head? before the eyes? at a distance? In the head, 28.7 per cent.; before the eyes, 36.2 per cent.; miscellaneous, 2.1 per cent.

4. How does the size of the image compare with the actual size of the scene? Same, 53.7 per cent.; smaller, 45.3 per cent.; miscellaneous, 1 per cent.

1. Can you call to mind better the face or the voice of a friend? Face, 75 per cent.; voice, 14.6 per cent.; miscellaneous, 1 per cent.

2. When "violin" is suggested, do you first think of the appearance of the instrument or the sounds made when it is played? Appearance, 76.8 per cent.; sounds, 23.2 per cent.

3. (a) Can you call to mind natural scenery, so that it gives you pleasure? (b) music? (c) the taste of fruit? Scenery: Yes, 94.6 per cent.; no, 4.3 per cent.; miscellaneous, 1.1 per cent. Music: yes, 89.1 per cent.; no, 9.8 per cent.; miscellaneous, 1.1 per cent. Taste of fruit: yes, 68.1 per cent.; no, 28.6 per cent.; miscellaneous, 3.3 per cent.

4. Have you ever mistaken a hallucination for a perception, e. g., apparently heard a voice or seen a figure when none was present? If you answer yes, describe the experience on the back of this sheet. Yes, 74.7 per cent.; no, 25.3 per cent.

The students have promised to submit to a re-testing once a year.
CHRISTISON.

NEURO-PATHOLOGY.

THE CONDITION OF THE TENDON REFLEXES IN TRANSVERSE MYELITIS. Wiener klinische Wochenschrift, Oct. 1, 1896. By Ernst Bischoff.

It has been known for some years that the patellar reflex may be absent when the spinal cord is completely destroyed in the cervical and upper thoracic regions (Bastian), and no satisfactory explanation has ever been given. Dr. Bischoff has examined the reported cases in which this condition had been present, and he concludes from the study of these that the reflexes may be lost when the interruption of cord fibres is incomplete, and may be preserved when the destruction of the fibres in *loco morbi* is total. The condition of lessened reflexes, according to him, is due to some process which has no direct connection with the spinal lesion, and is not dependent on its completeness or height, nor on the degree of the secondary degeneration.

His explanation is as follows: After the rapid formation of a partial or complete transverse lesion in the cervical or thoracic cord (with the exception of its lowest portion) the vasomotor nerves which supply the abdominal viscera and the lower portions of the body, together with the motor and sensory fibres, are paralyzed. This causes dilatation of the blood vessels in these parts and a decrease in the general blood pressure. The lumbar region of the cord suffers from the anæmia thus produced; its vitality is lessened, and the tendon reflexes are lost.

Acute decubitus, vomiting, diarrhœa, albumenuria, nephritis and occasional œdema of the legs, seen in such a condition, are the results of these vascular changes.

The vasomotor disturbance is only temporary, and if no organic changes have occurred, the reflexes may be restored.

The higher the spinal lesion is situated, the greater must be the vascular disturbance, as more fibres are destroyed.